

Claims

WHAT IS CLAIMED IS:

1. An assembly of a lubricant injector and a connector,

said connector comprising a body having an injector-engaging face,

5 said lubricant injector comprising a body having an inlet for lubricant under pressure, an outlet, a measuring chamber for receiving lubricant from the inlet, a piston movable through a stroke in the measuring chamber for the discharge of a measured volume of lubricant from the measuring chamber and thence through the outlet, and a valve responsive to pressure conditions in the inlet for operation of the injector in cycles in each of which the injector starts in a state of repose wherein pressure of lubricant in the inlet is relieved and the measuring chamber is charged with lubricant, progresses through a state wherein lubricant under pressure is delivered to the injector via the inlet for the discharge, and ends in a state for venting the injector to effect recharging of the measuring chamber involving the transmission of lubricant from the inlet to the measuring chamber,

10 said injector body having an elongate form with a face engaging said face of the connector body and detachably fastened thereon, the inlet of the injector being constituted by a chamber in the injector body adjacent one end thereof and an inlet passage extending from said face of the injector body to said inlet chamber, the outlet of the injector being constituted by an outlet passage extending from within the injector body to said face of the injector intermediate said inlet passage and the other end of the injector body, said connector body having lubricant supply passaging therein in communication at said faces with said inlet passage in the injector, said connector body further having lubricant outlet passaging therein in

communication at said faces with the outlet passage of said injector.

2. An assembly of a lubricant injector and a connector,

said connector comprising a body having an injector-engaging face,

5 said lubricant injector comprising a body having an inlet for lubricant under pressure from a supply, an outlet, a measuring chamber for receiving lubricant from the inlet, a piston movable through a stroke in the measuring chamber for discharging a measured volume of
10 lubricant therefrom, said injector having passaging for transmission of lubricant from the inlet to the measuring chamber and transmission of lubricant from the measuring chamber to the outlet, a valve movable between a first position for the transmission of lubricant from the inlet
15 to the measuring chamber and blocking the transmission of lubricant from the measuring chamber to the outlet and a second position for blocking the transmission of lubricant from the inlet to the measuring chamber and for the transmission of lubricant from the measuring chamber to the
20 outlet, said valve being biased to move from its second to its first position and responsive to certain pressure of lubricant in the inlet to overcome the bias and move from its first to its second position, said injector being operable in cycles each of which involves the injector
25 initially being in a first state due to relief of pressure in the inlet, in which state the valve is in first position and the measuring chamber is charged with lubricant, the injector progressing to a second state on increase of pressure in the inlet sufficient to overcome the bias and
30 move the valve to its second position, then progressing to a third state upon further increase in pressure in the inlet for discharging said volume, and finally a fourth state upon drop of pressure in the inlet wherein the valve is in its first position for venting the injector to effect

35 recharging of the measuring chamber involving the
transmission of lubricant from the inlet to the measuring
chamber,

said injector body having an elongate form with a
face engaging said face of the connector and detachably
40 fastened thereon, the inlet of the injector being
constituted by a chamber in the injector body adjacent one
end thereof and an inlet passage extending from said face
of the injector body to said inlet chamber, the outlet of
the injector being constituted by an outlet passage
45 extending from within the injector body to said face of the
injector intermediate the said inlet passage and the other
end of the injector body, said connector body having
lubricant supply passaging therein in communication at said
faces with said inlet passage in the injector, said
50 connector body further having lubricant outlet passaging
therein in communication at said faces with the outlet
passage of said injector.

3. An assembly of a lubricant injector and a
connector,

said connector comprising a body having an injector-
engaging face,

5 said lubricant injector comprising a body having a
differential cylinder therein, a differential piston
slidable forward in the cylinder from a retracted position
establishing a measuring chamber for a charge of lubricant
on the forward side of the piston and a pressure chamber of
10 smaller cross-sectional area than the measuring chamber on
the rearward side of the piston, said piston being movable
forward from retracted position through a stroke for
discharging a measured volume of lubricant from the
measuring chamber and rearward back to retracted position
15 for the recharging of said measuring chamber, said injector
being operable in cycles for discharging said measured
volume on each cycle and then recharging said measuring
chamber and holding the charge for the next cycle, said

body having an inlet for lubricant under pressure, an
outlet for the discharge, primary passaging for the
transmission of lubricant under pressure from said
measuring chamber to the outlet for the discharge of said
volume and for transmission of lubricant under pressure
from the inlet to the measuring chamber for the charging
thereof with lubricant under pressure, said body further
having auxiliary passaging for transmission of lubricant
under pressure from the inlet to the pressure chamber and
back from the pressure chamber, a valve movable in the body
between a first position wherein it opens said primary
passaging for charging said measuring chamber and blocks
said primary passaging from discharging said volume and a
second position wherein it blocks said primary passaging
against recharging said measuring chamber and opens said
primary passaging for discharge of said volume from said
measuring chamber, said valve being biased to move from its
second to its first position and being movable from its
first to its second position in response to increase in the
pressure of lubricant in the inlet, said injector being in
a first state, namely, a state of repose, when inlet
pressure is in relief, the valve being in its first
position, the measuring chamber then holding a charge of
lubricant under pressure and the differential piston being
in retracted position, the pressure chamber being in
communication with the inlet, a second state when inlet
pressure increases sufficiently to overcome the valve bias
and move the valve to second position, then progressing to
a third state upon further increase in pressure in the
inlet for discharging said measured volume, and finally a
fourth state upon drop in pressure in the inlet wherein the
valve is in its first position for venting the injector for
the recharge of the measuring chamber involving the
transmission of lubricant from the inlet to the measuring
chamber,

said injector body having an elongate form with a face
engaging said face of the connector and detachably fastened

thereon, the inlet of the injector being constituted by a chamber in the injector body adjacent one end thereof and an inlet passage extending from said face of the injector body to said inlet chamber, the outlet of the injector being constituted by an outlet passage extending from within the injector body to said face of the injector intermediate the said inlet passage and the other end of the injector body, said connector body having lubricant supply passaging therein in communication at said faces with said inlet passage in the injector, said connector body further having lubricant outlet passaging therein in communication at said faces with the outlet passage of said injector.

4. An assembly of a lubricant injector and a connector,

said connector comprising a body having an injector-engaging face,

said lubricant injector comprising an elongate body having a longitudinal axis, a differential cylinder extending longitudinally of the body on said axis adjacent one end, said differential cylinder having first and second sections with the second section of smaller cross-sectional area than the first section and extending from the first section in the direction toward the other end of the body, a differential piston having first and second sections sealingly slidable in respective first and second sections of the differential cylinder, the first section of the cylinder providing a measuring chamber and the second providing a pressure chamber, an inlet in the other end of the body for the entry of lubricant under pressure from a supply line, an elongate discharge chamber in the body in line with the differential cylinder, an outlet extending from the discharge chamber, a bore extending from the discharge chamber to the inlet, a dual charging and discharging passage extending lengthwise in the body and communicating with the measuring chamber, a first

transverse passage communicating with the dual passage and
25 said bore, a second transverse passage communicating with
the dual passage and said bore, a second lengthwise passage
extending from the inlet to the pressure chamber and
communicating with said dual passage, a slide valve
30 slidable in the bore subject to pressure of lubricant in
the inlet, said slide valve having a passage therein
extending to said discharge chamber and being slidable
between first and second positions, said slide valve being
formed for blocking said first transverse passage and
35 establishing communication between said second transverse
passage and the passage in the valve in the first position
and blocking said second transverse passage and
establishing communication between the first transverse
passage and the passage in the valve in the second
40 position, at least one coil compression spring in said
discharge chamber biasing the valve to move from second to
first position, the valve being movable by pressure in the
inlet from its first to its second position,

said injector body having an elongate form with a face
engaging said face of the connector and detachably fastened
45 thereon, the inlet of the injector being constituted by a
chamber in the injector body adjacent one end thereof and
an inlet passage extending from said face of the injector
body to said inlet chamber, the outlet of the injector
being constituted by an outlet passage extending from
50 within the injector body to said face of the injector
intermediate the said inlet passage and the other end of
the injector body, said connector body having lubricant
supply passaging therein in communication at said faces
with said inlet passage in the injector, said connector
55 body further having lubricant outlet passaging therein in
communication at said faces with the outlet passage of said
injector.

5. An assembly comprising a plurality of injectors
and a manifold,

said manifold comprising a body having an injector-engaging face,

5 each injector comprising an elongate body having a face engaging said face of the manifold and detachably fastened thereon, each injector having an inlet constituted by a chamber in the injector body adjacent one end thereof and an inlet passage extending from said face of the
10 injector to said inlet chamber, each injector having an outlet constituted by an outlet passage extending from within the injector body to said face of the injector intermediate its said inlet passage and the other end of the injector body, said manifold body having lubricant
15 supply passaging therein in communication at said faces with said inlet passages, said manifold body further having lubricant outlet passaging therein in communication at said faces with the outlet passages of said injectors.

6. An assembly comprising a plurality of injectors and a manifold,

said manifold comprising an elongate block having an injector-engaging face,

5 a plurality of injectors, each comprising a body having an inlet for lubricant under pressure, an outlet, a measuring chamber for receiving lubricant from the inlet, a piston movable through a stroke in the measuring chamber for the discharge of a measured volume of lubricant from
10 the measuring chamber and thence through the outlet, and a valve responsive to pressure conditions in the inlet for operation of the injector in cycles in each of which the injector starts in a state of repose wherein pressure of lubricant in the inlet is relieved and the measuring
15 chamber is charged with lubricant, progresses through a state wherein lubricant under pressure is delivered to the injector via the inlet for the discharge, and ends in a state for venting the injector to effect recharging of the measuring chamber involving the transmission of lubricant
20 from the inlet to the measuring chamber,

the body of each injector having a face engaging with said face of the manifold and detachably fastened thereon, the inlet of each injector being constituted by a chamber in the injector body adjacent one end thereof and an inlet passage extending from said face of the injector to said inlet chamber, the outlet of each injector being constituted by an outlet passage extending from within the injector body to said face of the injector intermediate the said inlet passage and the other end of the injector body, said manifold body having lubricant supply passaging therein in communication at said faces with said inlet passages, said manifold body further having lubricant outlet passaging therein in communication at said faces with the outlet passages of said injectors.

7. An assembly comprising a plurality of injectors and a manifold,

said manifold comprising an elongate block having an injector-engaging face,

a plurality of injectors, each comprising a body having an inlet for lubricant under pressure from a supply, an outlet, a measuring chamber for receiving lubricant from the inlet, a piston movable through a stroke in the measuring chamber for discharging a measured volume of lubricant therefrom, said injector having passaging for transmission of lubricant from the inlet to the measuring chamber and transmission of lubricant from the measuring chamber to the outlet, a valve movable between a first position for the transmission of lubricant from the inlet to the measuring chamber and blocking the transmission of lubricant from the measuring chamber to the outlet and a second position for blocking the transmission of lubricant from the inlet to the measuring chamber and for the transmission of lubricant from the measuring chamber to the outlet, said valve being biased to move from its second to its first position and responsive to certain pressure of lubricant in the inlet to overcome the bias and move from

its first to its second position, said injector being operable in cycles each of which involves the injector initially being in a first state due to relief of pressure in the inlet, in which state the valve is in first position and the measuring chamber is charged with lubricant, the injector progressing to a second state on increase of pressure in the inlet sufficient to overcome the bias and move the valve to its second position, then progressing to a third state upon further increase in pressure in the inlet for discharging said volume, and finally a fourth state upon drop of pressure in the inlet wherein the valve is in its first position for venting the injector to effect recharging of the measuring chamber involving the transmission of lubricant from the inlet to the measuring chamber,

the body of each injector having a face engaging said face of the manifold and detachably fastened thereon, the inlet of each injector being constituted by a chamber in the injector body adjacent one end thereof and an inlet passage extending from said face of the injector to said inlet chamber, the outlet of each injector being constituted by an outlet passage extending from within the injector body to said face of the injector intermediate the said inlet passage and the other end of the injector body, said manifold body having lubricant supply passaging therein in communication at said faces with said inlet passages, said manifold body further having lubricant outlet passaging therein in communication at said faces with the outlet passages of said injectors.

8. An assembly comprising a plurality of injectors and a manifold,

said manifold comprising an elongate block having an injector-engaging face,

a plurality of injectors, each comprising a body having a differential cylinder therein, a differential piston slidable forward in the cylinder from a retracted

position establishing a measuring chamber for a charge of
 lubricant on the forward side of the piston and a pressure
 chamber of smaller cross-sectional area than the measuring
 chamber on the rearward side of the piston, said piston
 being movable forward from retracted position through a
 stroke for discharging a measured volume of lubricant from
 the measuring chamber and rearward back to retracted
 position for the recharging of said measuring chamber, said
 injector being operable in cycles for discharging said
 measured volume on each cycle and then recharging said
 measuring chamber and holding the charge for the next
 cycle, said body having an inlet for lubricant under
 pressure, an outlet for the discharge, primary passaging
 for the transmission of lubricant under pressure from said
 measuring chamber to the outlet for the discharge of said
 volume and for transmission of lubricant under pressure
 from the inlet to the measuring chamber for the charging
 thereof with lubricant under pressure, said body further
 having auxiliary passaging for transmission of lubricant
 under pressure from the inlet to the pressure chamber and
 back from the pressure chamber, a valve movable in the body
 between a first position wherein it opens said primary
 passaging for charging said measuring chamber and blocks
 said primary passaging from discharging said volume and a
 second position wherein it blocks said primary passaging
 against recharging said measuring chamber and opens said
 primary passaging for discharge of said volume from said
 measuring chamber, said valve being biased to move from its
 second to its first position and being movable from its
 first to its second position in response to increase in the
 pressure of lubricant in the inlet, said injector being in
 a first state, namely, a state of repose, when inlet
 pressure is in relief, the valve being in its first
 position, the measuring chamber then holding a charge of
 lubricant under pressure and the differential piston being
 in retracted position, the pressure chamber being in
 communication with the inlet, a second state when inlet

45 pressure increases sufficiently to overcome the valve bias
and move the valve to second position, then progressing to
a third state upon further increase in pressure in the
inlet for discharging said measured volume, and finally a
50 fourth state upon drop in pressure in the inlet wherein the
valve is in its first position for venting the injector for
the recharge of the measuring chamber involving the
transmission of lubricant from the inlet to the measuring
chamber,

55 the body of each injector having a face engaging said
face of the manifold and detachably fastened thereon, the
inlet of each injector being constituted by a chamber in
the injector body adjacent one end thereof and an inlet
passage extending from said face of the injector to said
inlet chamber, the outlet of each injector being
60 constituted by an outlet passage extending from within the
injector body to said face of the injector intermediate the
said inlet passage and the other end of the injector body,
said manifold body having lubricant supply passaging
therein in communication at said faces with said inlet
65 passages, said manifold body further having lubricant
outlet passaging therein in communication at said faces
with the outlet passages of said injectors.

9. An assembly comprising a plurality of injectors
and a manifold,

said manifold comprising an elongate block having an
injector-engaging face,

5 a plurality of injectors, each comprising an elongate
body having a longitudinal axis, a differential cylinder
extending longitudinally of the body on said axis adjacent
one end, said differential cylinder having first and second
sections with the second section of smaller cross-sectional
10 area than the first section and extending from the first
section in the direction toward the other end of the body,
a differential piston having first and second sections
sealingly slidable in respective first and second sections

of the differential cylinder, the first section of the
 cylinder providing a measuring chamber and the second
 providing a pressure chamber, an inlet in the other end of
 the body for the entry of lubricant under pressure from a
 supply line, an elongate discharge chamber in the body in
 line with the differential cylinder, an outlet extending
 from the discharge chamber, a bore extending from the
 discharge chamber to the inlet, a dual charging and
 discharging passage extending lengthwise in the body and
 communicating with the measuring chamber, a first
 transverse passage communicating with the dual passage and
 said bore, a second transverse passage communicating with
 the dual passage and said bore, a second lengthwise passage
 extending from the inlet to the pressure chamber and
 communicating with said dual passage, a slide valve
 slidable in the bore subject to pressure of lubricant in
 the inlet, said slide valve having a passage therein
 extending to said discharge chamber and being slidable
 between first and second positions, said slide valve being
 formed for blocking said first transverse passage and
 establishing communication between said second transverse
 passage and the passage in the valve in the first position
 and blocking said second transverse passage and
 establishing communication between the first transverse
 passage and the passage in the valve in the second
 position, at least one coil compression spring in said
 discharge chamber biasing the valve to move from second to
 first position, the valve being movable by pressure in the
 inlet from its first to its second position,

the body of each injector having a face engaging said
 face of the manifold and detachably fastened thereon, the
 inlet of each injector being constituted by a chamber in
 the injector body adjacent one end thereof and an inlet
 passage extending from said face of the injector to said
 inlet chamber, the outlet of each injector being
 constituted by an outlet passage extending from within the
 injector body to said face of the injector intermediate the

said inlet passage and the other end of the injector body, said manifold body having lubricant supply passaging therein in communication at said faces with said inlet passages, said manifold body further having lubricant outlet passaging therein in communication at said faces with the outlet passages of said injectors.

10. An assembly of a lubricant injector and a connector, said connector comprising a body having an injector-engaging face, said injector comprising an elongate body having a face engaging said face of the connector and detachably fastened thereon, the injector having an inlet constituted by a chamber in the injector body adjacent one end thereof and an inlet passage extending from said face of the injector to said inlet chamber, the injector having an outlet constituted by an outlet passage extending from within the injector body to said face of the injector intermediate the said inlet passage and the other end of the injector body, said connector body having lubricant supply passaging therein in communication at said faces with said inlet passage, said connector body further having lubricant outlet passaging therein in communication at said faces with the outlet passage of said injector.